LCM16A2-002 User's Manual
A202 Ver 0.0

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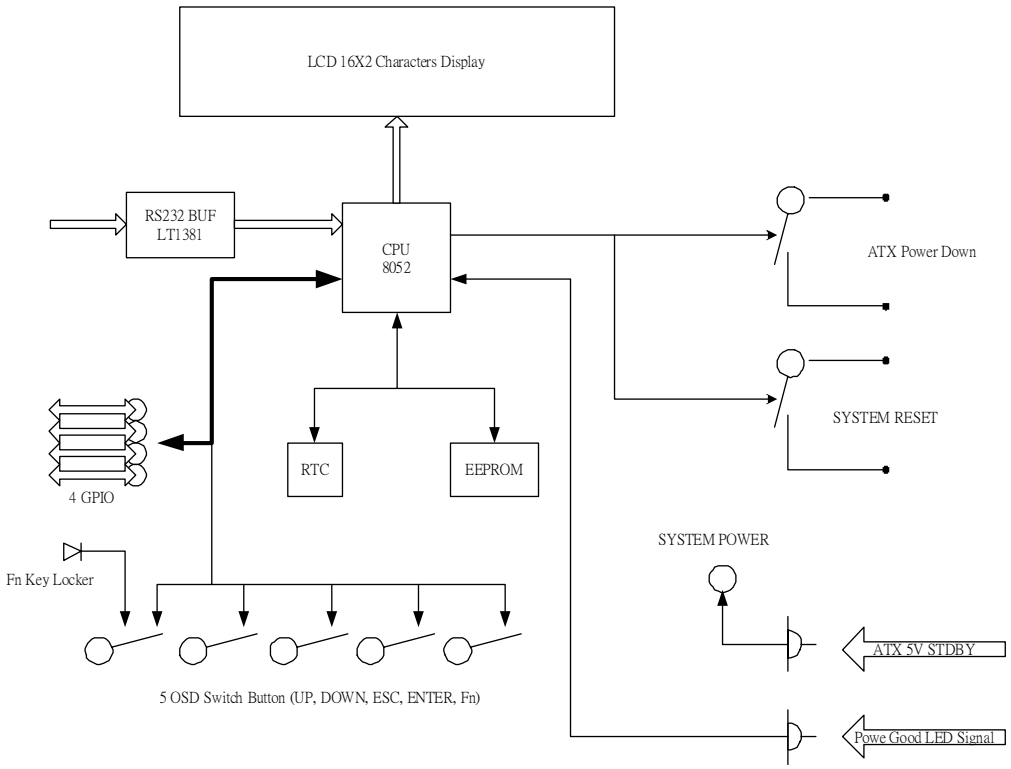
INTRODUCTION

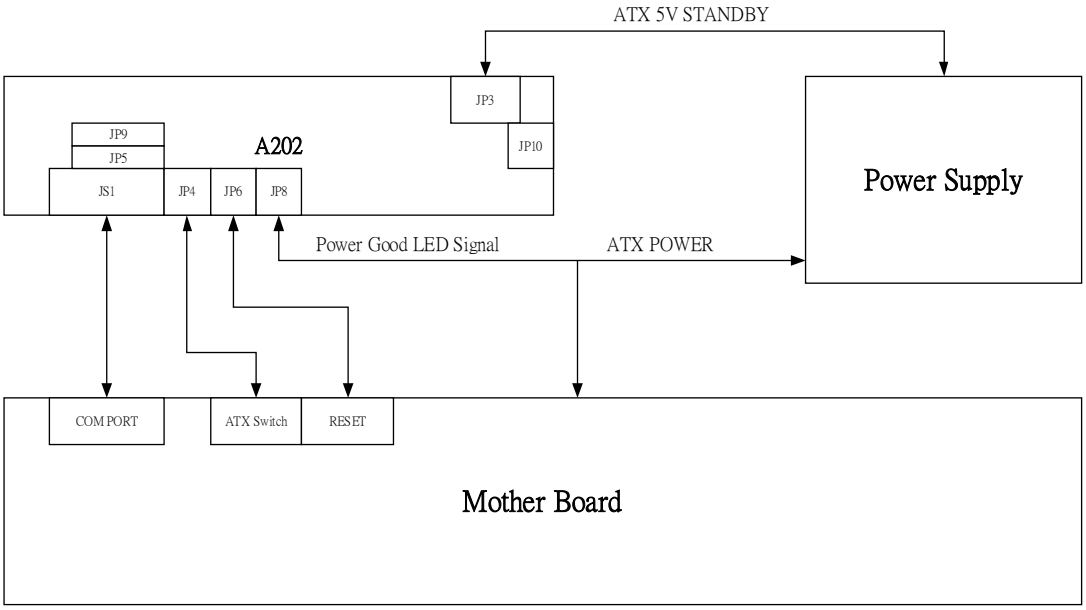
A202 is a LCD Module designed for system to display messages to outlet. The maximum text allowed is 16 characters and 2 lines, This device working under 5V power system and use a RS232 interface to communicate with system. Following the ICP Peripheral Communication Protocol (described in Appendix A), A202 has versatile functions, there are :

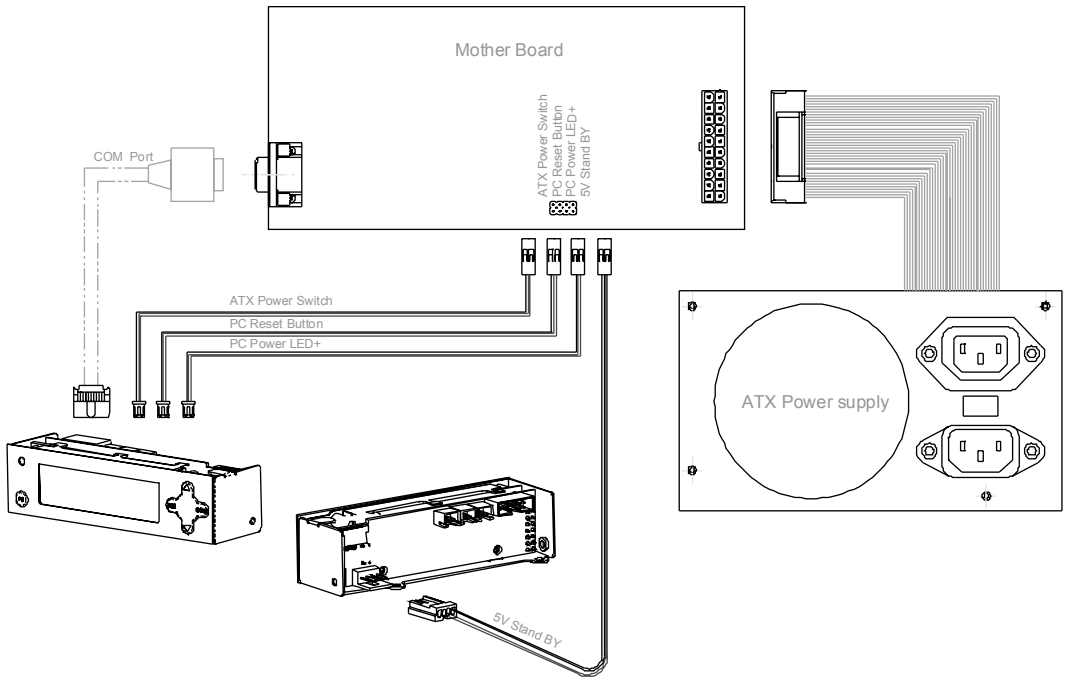
a. One first display page.
b. Eight auto-rolling display pages.
c. One adjustable Watch-Dog-Timer.
d. Could Daily to turn on or turn off system automatically.
e. Adjustable back-light brightness.
f. Four GPIO.
g. One battery-backup real time clock.
h. Internal OSD for user easy to configure .
i. Five Programmable Buttons (Four OSD buttons and One extra function button.)

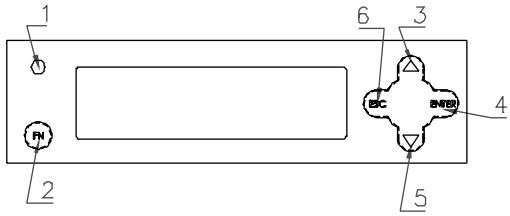
Block Diagram



Connect to PC







1	Power LED
2	Fn Button (Button 4)
3	Up Button (Button 1)
4	Enter Button (Button 2)
5	Down Button (Button 3)
6	ESC Button (Button 0)

Pin Definition

JS1	1	NC		Float
	2	Tx	Out	A202 Output to PC
	3	Rx	In	A202 Input from PC
	4	NC		Inner Connect to Pin 6
	5	Gnd		Connect to Ground
	6	NC		Inner Connect to Pin 4
	7	NC		Inner Connect to Pin 8
	8	NC		Inner Connect to Pin 7
	9	NC		Float
	10	NC		Float

Note: JS1 uses fixed 1200 Baud Rate, 8 bit, 1 stop bit, no parity check,±12V Signal.

JP5	1	Power		+5VDC out
	2	Rx	In	A202 Input from PC
	3	Tx	Out	A202 Output to PC
	4	Ground		Ground

Note: JJP5 uses fixed 1200 Baud Rate, 8 bit, 1 stop bit, no parity check, +5V TTL Signal.

JP3	1	NC		
	2	Ground		Ground
	3	Ground		Ground
	4	Power		+5VDC in

Note: Strongly to suggest user to connect JP3 pin 4 to ATX StandBy 5V Power, or many functions of A202 like auto-turn-on, turn-on-now functions could not working when system is turn off.

JP4	1	ATX Power Switch Pin 1	Bi-Dir	Common Point
	2	ATX Power Switch Pin 2	Bi-Dir	Normal Open Point

JP6	1	Reset Pin 1	Bi-Dir	Reset Switch Common Point
	2	Reset Pin 2	Bi-Dir	Reset Switch Normal Open Point

JP8	1	Power Good LED+	In	Power Good LED+
	2	NC		Float

Note: A202 use JP8 Pin1 to know System is under Power On or Power Off, if this pin is not connected, it will cause A202 try to turn on PC or turn off PC without reference

JP9	1	GPIO0	I/O	Open Drain, weak Pull High, CMOS I/O Pin
	2	GPIO1	I/O	"
	3	GPIO2	I/O	"
	4	GPIO3	I/O	"

JP11	1	Fn_Key	In	Connect to A202 Button 4 input
	2	ESC_Key	In	Connect to A202 Button 0 input
	3	Up_Key	In	Connect to A202

				Button 1 input
	4	Enter_Key	In	Connect to A202 Button 2 input
	5	Down_Key	In	Connect to A202 Button 3 input
	6	Ground	Power	Ground

JP10	Pin 1, 2	Open	Press Fn_Key Could Active All OSD Function
		Short	Press Fn_Key Could only Active OSD Turn_On/Off and Reset_Sys two Function , the others is been lock.
	Pin 3, 4	Open	Press Fn_Key Could Active OSD. (Fn_Key is a special key and been reserved to A202 to Open OSD use only.)
		Short	Fn_Key become a normal key and released for system use, Press Fn_Key will no longer to enter OSD, and be treated like the other 4 keys.

Note 1 : Pin 1, 2 Jumper is used to prevent end user to change A202's setting after system is shipped out to end user.
Note 2 : Pin 3, 4 Jumper specially useful for the system programmer, who would like have his own OSD and would like to have whole control of the five buttons.

OSD Function Description

Note: Before to use OSD of A202, remember to open JP10 pin1 and pin2, which will enable the OSD working.

Press Fn Key on the front panel then will enter OSD setting Manuel.

A202 use the Up, Down, ESC, Enter 4 button to control the OSD, mostly meaning of keys is

Up Key : Select Up forward Manuel or alpha-number.

Down Key : Select Down forward Manuel or alpha-number.

ESC Key : Exit or Escape current Manuel.

Enter Key : Active current Manuel Item or Enter the next page of Manuel.

There are about 31 items of OSD Manuel list in the OSD, press Fn_Key will appear OSD on the LCD which would look like :

```
> TURN ON/OFF NOW
  RESET SYS NOW
```

#	Display	Description
1	TURN ON/OFF NOW	Turn on or turn off system now
2	RESET SYS NOW	Reset system now
3	EDIT FIRST PAGE	Edit the content of the First_Display_Page, This Page will display only one time and firstly when system is power on, but if First_Page (item 12) is turn off , there will no display of this page, this page will be retained depend the First_Page_Timer (item 22) setting.
4	EDIT AUTO PAGE0	Edit the content of the Auto_Display_Page_0, This page will display automatically if the Auto_Page0 (item 13) is turn On and Autodisplay (item 21) is turn On, this page will be retained depend the Auto_Page_Timer setting.
5	EDIT AUTO PAGE1	Same as item 4
6	EDIT AUTO PAGE2	Same as item 4
7	EDIT AUTO PAGE3	Same as item 4
8	EDIT AUTO PAGE4	Same as item 4
9	EDIT AUTO PAGE5	Same as item 4
10	EDIT AUTO PAGE6	Same as item 4
11	EDIT AUTO PAGE7	Same as item 4
12	FIRST PAGE ON/OFF	Enable or Disable First Page to be displayed
13	AUTO PAGE0 ON/OFF	Enable or Disable Page0 to be displayed
14	AUTO PAGE1 ON/OFF	Same as item 13
15	AUTO PAGE2 ON/OFF	Same as item 13
16	AUTO PAGE3 ON/OFF	Same as item 13
17	AUTO PAGE4 ON/OFF	Same as item 13
18	AUTO PAGE5 ON/OFF	Same as item 13
19	AUTO PAGE6 ON/OFF	Same as item 13

20	AUTO PAGE7 ON/OFF	Same as item 13
21	AUTODISPLAY ON/OFF	Globally to Enable or Disable all Auto Page to be displayed.
22	FIRSTPAGE TIMER	Setup the time of First Page will be displayed
23	AUTO PAGE TIMER	Setup the time of each Auto Page to be displayed
24	WATCH DOG TIMER	Setup the count down timer of WatchDog
25	WATCH DOG ON/OFF	Enable or Disable the WatchDog
26	SET ShtDwn TIMER	Setup the Daily Tme to Turn Off the system
27	AUTO ShtDwn ON/OFF	Enable or Disable the Auto Shutdown function
28	SET TurnOn Timer	Setup the Daily Time to Turn On the System
29	AUTO TurnOn ON/OFF	Enable or Disable Auto Turn On function
30	SET CLOCK TIMER	Setup A202 RTC (real time clock)
31	SET BACK LIGHT	Setup the Brightness of Back Light

The working flow of A202 :

```
Power_On_Initialize();
If(System_is_Off ) Turn_On_System();
If(First_Display_is_Turn_On)Display_First_Display_Page() until First_Page_Time_Out();
While(1){
   If(AutoDisplay_is_Turn_On){
     If(Auto_Display_Page_n_is_Turn_On){
         Display_Auto_Page_n() until Auto_Display_Time_Out;
         Next_auto_display_page();
         If(Auto_Display_index > Page7)Auto_Display_index=Page0;
       }
   }
   if(WDT_is_turn_on && WDT_is_time_out)Reset_System();
   if(Auto_ShutDown_is Turn_On && ShutDown_Timer_is_Arrive)ShutDown_System();
   if(Auto_TurnOn_is_Turn_On && TurnOn_Timer_is_Arrive)Turn_On_System();
   if(Fn_Key_is_Pressed && Fn_Key_is_not_Locked){
      if(OSD_is_not_Locked)Enter_OSD_item0_to_item31();
      else Enter_OSD_item0_to_item1();
    }
   if(Rs232IsAvailable)Call_A202_Protocol();
   if(Key_Pressed)Report_Key_Status();
}
```

How to use software to Displaying Messages on LCD

Use Rs232 (B1200, N, 8, 1) PC Interface, A202 is able to display most of the characters you can find on the ASCII code. Here is an example to display text messages on the LCD.

Send to A202: 0x4D 0x7C 0x00 (optional)

Where :
0x4D The Leading Code.
0x7C Switch All Auto Display ON/OFF Command.
0x00 Turn **OFF**

Send to A202: 0x4D 0x0D (optional)

Where :
0x4D The Leading Code.
0x0D Clear LCD Command.

Send to A202: 0x4D 0x0C 0x00 0x03 0x49 0x43 0x50

Where:

0x0C Display Character on LCD
0x00 Characters displayed on line0 (first line on LCD)
0x03 3 characters will be displayed
0x49 0x43 0x50 ASCII codes for **ICP**

The A202 first clear the screen then the text **ICP** is display on the upper-left corner of LCD look like

ICP

How to use buttons
When buttons on A202 is been pressed or released, A202 will automatically to transmit electric signal (RS232 code) to PC at once like.

When button 0 (ESC Button) be pressed :
A202 send to PC : 0x53 0x05 0x00 0x01;

Where
0x53 The leading code of A202.
0x05 Report Button Status.
0x00 Button data byte 0.
0x01 Button data byte 1, the bit 0 of byte 1 respect the button 0 (ESC Button) is pressed.

When button 0 (ESC Button) be released after pressed :
A202 send to PC : 0x53 0x05 0x00 0x00;

Where
0x53 The leading code of A202.
0x05 Report Button Status.
0x00 Button data byte 0.
0x00 Button data byte 1, the bit 0 of byte 1 respect the button 0 (ESC Button) is released.

Please Note : if the internal OSD is enabled (JP10 pin 1_2, pin 3_4 is open) and Fn has been pressed and A202 is then enter internal OSD (embedded OSD), then in this status, all button's status will be captured by A202 and no transmit to PC until leave OSD.

Please reference Appendix A to know more useful instructions of A202, and the Demo Program is on Appendix D.

CAUTION : Danger of explosion if battery is incorrectly replaced.
Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer instruction.

Appendix A

The ICP Peripheral Communication Protocol Version 0.02

History

2001/03/20	Version 0.01
2001/10/29	Version 0.02 Addition Command Turn On/Off Back Light (0x5E)
2002/12/13	Version 0.03

Get ID : 0x00 and **Report ID** : 0x01

Direction	PC → A202
Command	0x4D 0x00
Explain	0x4D=Leading Code of PC; 0x00=**Get ID** Command
Example	0x4D 0x00
Response	A202 → PC
Command	0x53 0x01 0xXX 0xYY
Explain	0x53=Leading Code of A202; 0x01=**Report ID** Command; 0xXXYY=ID;
Example	0x53 0x01 0x00 0xCA (Board ID= 0x00CA ---A202)

Get Button Status : 0x06 and **Report Button Status** : 0x05

Direction	PC → A202
Command	0x4D 0x06
Explain	0x4D=Leading Code of PC; 0x06=**Get Button Status** Command
Example	0x4D 0x06
Response	A202 → PC
Command	0x53 0x05 0xXX 0xYY
Explain	0x53=Leading Code of A202; 0x05=**Report Button Status** Command; 0xXXYY=Buttons on/off , XXYY<15:0>=Button<15:0>, 1=Pressed, 0=Release Bit0=Esc_Button, Bit1=Up_Button, Bit2=Enter_Button, Bit3=Down_Button, Bit4=Fn_Button.
Example	0x53 0x05 0x00 0x11 (Esc_Button and Fn_Button is Pressed) 0x53 0x05 0x00 0x00 (All Key are released)
Note	**Report Button Status** Command will automatically report to PC when button is pressed or released.

Get Protocol Version : 0x07 and **Report Protocol Version** : 0x08

Direction	PC → A202
Command	0x4D 0x07
Explain	0x4D=Leading Code of PC; 0x07=**Get Protocol Version** Command
Example	0x4D 0x07
Response	A202 → PC
Command	0x53 0x08 0xXX 0xYY
Explain	0x53=Leading Code of A202; 0x08=**Report Protocol Version** Command; 0xXX=Class Number; 0xYY=Version Number
Example	0x53 0x08 0x00 0x03 (Class 00, Version 03)

Set Clock Time : 0x09

Direction	PC → A202
Command	0x4D 0x09 0xYY 0xMM 0xDD 0xHH 0xmm 0xSS

Explain	0x4D=Leading Code of PC; 0x09=**Set Clock Time** Command; 0xYY=Year (00~99) Map to (2000 ~ 2099) 0xMM=Month (01 ~ 12) 0xDD=Day (01 ~ 31) 0xHH=Hour in 24Hr Type (00~23) 0xmm=Minute (00~59) 0xSS=Second (00~59)
Example	0x4D 0x09 0x00 0x0C 0x07 0x0D 0x28 0x05 (Set A202 RTC (real time clock) on 2000/12/07 13:40:05)
Response	A202 → PC
Command	0xFA
Explain	Acknowledge OK
Example	0xFA

Get Clock Time : 0x0B and **Report Clock Time** : 0x0A

Direction	PC → A202
Command	0x4D 0x0B
Explain	0x4D=Leading Code of PC; 0x0B=**Get Clock Time** Command
Example	0x4D 0x0B
Response	A202 →PC
Command	0x53 0x0A 0xYY 0xMM 0xDD 0xHH 0xmm 0xSS
Explain	0x53=Leading Code of A202; 0x0A=**Report Clock Time** Command; 0xYY=Year (00 ~ 99) Map to (2000 ~ 2099) 0xMM=Month (01 ~ 12) 0xDD=Day (01 ~ 31) 0xHH=Hour in 24Hr Type (00~23) 0xmm=Minute (00~59) 0xSS=Second (00~59)
Example	0x53 0x0A 0x00 0x0C 0x07 0x0D 0x28 0x09 (Report Time 2000/12/07 13:40:09)

Display Character On LCD: 0x0C

Direction	PC → A202
Command	0x4D 0x0C 0x0L 0x0N $0xCC_1$ ~ $0xCC_{16}$
Explain	0x4D=Leading Code of PC; 0x0C=**Display Character On LCD** Command; 0x0L=0x00 (Line 0) or 0x01 (Line 1); 0x0N=N Character (1~16), no more than 16 characters; 0xCCn=ASCII Code of Characters,
Example	0x4D 0x0C 0x01 0x03 0x49 0x43 0x50 (Line 1, 3 Characters, **ICP**)
Response	A202 →PC
Command	0xFA
Explain	Acknowledge OK
Example	0xFA

Clear LCD : 0x0D

Direction	PC → A202
Command	0x4D 0x0D
Explain	0x4D=Leading Code of PC; 0x0D=**Clear LCD** Command
Example	0x4D 0x0D
Response	A202 →PC
Command	0xFA
Explain	Acknowledge OK
Example	0xFA

Cursor Go to : 0x54

Direction	PC → A202
Command	0x4D 0x54 0xXX 0xYY
Explain	0x4D=Leading Code of PC; 0x54=**Cursor Go to** Command; 0xXX=X (column) Position of LCD, from 0 to 15; 0xYY=Y (line) Position of LCD, from 0 to 1.
Example	0x4D 0x54 0x00 0x00 (cursor go to line 0, column 0) 0x4D 0x54 0x03 0x01 (cursor go to line 1, column 3))
Response	A202 →PC
Command	0xFA
Explain	Acknowledge OK
Example	0xFA

Set Back Light : 0x5E

Direction	PC → A202
Command	0x4D 0x5E 0x0L
Explain	0x4D=Leading Code of PC; 0x5E=**Set Back Light** Command; 0x0L=Back Light Brightness Level from 0x00 to 0x04, 0=Dark, 4=Fully Bright
Example	0x4D 0x5E 0x01 (Set Back Light Level on level 1) 0x4D 0x5E 0x00 (Turn Off Back Light)
Response	A202 →PC
Command	0xFA
Explain	Acknowledge OK
Example	0xFA

Set First Display Content : 0x70

Direction	PC → A202
Command	0x4D 0x70 0x0S 0x0N $0xCC_1$ ~ $0xCC_n$
Explain	0x4D=Leading Code of PC; 0x70=**Set First Display Content** Command; 0x0S=Display Enable or Disable, 1=Enable, 0=Disable; 0x0N=Total Number of Characters to write, from 1 to 32; $0xCC_1$ ~ $0xCC_n$=Display Content in ASCII code;
Example	0x4D 0x70 0x01 0x03 0x49 0x43 0x50 (Setup First Display Content, The Display is Enable, Display **ICP** on the Line 0, the other are white space)
Response	A202 →PC
Command	0xFA
Explain	Acknowledge OK
Example	0xFA

Get First Display Content : 0x71 and **Report First Display Content** : 0x72

Direction	PC → A202
Command	0x4D 0x71
Explain	0x4D=Leading Code of PC; 0x71=**Get First Display Content** Command;
Example	0x4D 0x71
Response	A202 →PC
Command	0x53 0x72 0x0S $0xCC_1$ ~ $0xCC_{32}$
Explain	0x53=Leading Code of A202; 0x72=**Report First Display Content** Command; 0x0S=Display Enable or Disable, 1=Enable, 0=Disable; $0xCC_1$ ~ $0xCC_{32}$=Display Content in ASCII code, Totally 32 characters;
Example	0x53 0x72 0x01 0x49 0x43 0x50 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x49 0x43 0x50 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 (First Display is Enable, the content is **ICP**, the other are white spaces)

Set First Display Retain : 0x73

Direction	PC → A202
Command	0x4D 0x73 0xHH 0xLL
Explain	0x4D=Leading Code of PC; 0x73=**Set First Display Retain** Command; 0xHHLL=Seconds of First Display to be Retained on LCD, from 0000 to 9999 sec. 0xHH=high eight bits, 0xLL=low eight bits.
Example	0x4D 0x73 0x00 0x10 (Set First Display Retain 0x0010=16 seconds displayed on LCD);
Response	A202 →PC
Command	0xFA
Explain	Acknowledge OK
Example	0xFA

Get First Display Retain : 0x74 and **Report First Display Retain** : 0x75

Direction	PC → A202
Command	0x4D 0x74
Explain	0x4D=Leading Code of PC; 0x74=**Get First Display Retain** Command;
Example	0x4D 0x74
Response	A202 →PC
Command	0x53 0x75 0xHH 0xLL
Explain	0x53=Leading Code of A202; 0x75=**Report First Display Retain** Command; 0xHHLL=Seconds of First Display to be Retained on LCD, from 0000 to 9999 sec. 0xHH=high eight bits, 0xLL=low eight bits.
Example	0x53 0x75 0x00 0x10 (The First Display Retain Time is 0x0010=16 seconds)

Set Auto Display Content : 0x76

Direction	PC → A202
Command	0x4D 0x76 0x0P 0x0S 0x0N $0xCC_1$ ~ $0xCC_n$
Explain	0x4D=Leading Code of PC; 0x76=**Set Auto Display Content** Command; 0x0P=Which Page to be Set, from 0 to 7; 0x0S=Display Enable or Disable, 1=Enable, 0=Disable; 0x0N=Total Number of Characters to write, from 1 to 32; $0xCC_1$ ~ $0xCC_n$=Display Content in ASCII code;
Example	0x4D 0x76 0x02 0x01 0x03 0x49 0x43 0x50 (Set Auto Display Page 2, Display is Enable, 3 character, Display **ICP** on the Line 0, the other are white space)
Response	A202 →PC
Command	0xFA
Explain	Acknowledge OK
Example	0xFA

Get Auto Display Content : 0x77 and **Report Auto Display Content** : 0x78

Direction	PC → A202
Command	0x4D 0x77 0x0P
Explain	0x4D=Leading Code of PC; 0x77=**Get Auto Display Content** Command; 0x0P=Which Page, from 0 to 7;
Example	0x4D 0x77 0x02 (Get Auto Page 2 content)
Response	A202 →PC
Command	0x53 0x78 0x0P 0x0S $0xCC_1$ ~ $0xCC_{32}$
Explain	0x53=Leading Code of A202; 0x78=**Report First Display Content** Command; 0x0P=Which page, from 0 to 7; 0x0S=Display Enable or Disable, 1=Enable, 0=Disable; $0xCC_1$ ~ $0xCC_{32}$=Display Content in ASCII code, Totally 32 characters;
Example	0x53 0x78 0x02 0x01 0x49 0x43 0x50 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 0x20 (Report Auto Display Page 2 content, Display is Enable, the

	content is **ICP**, the other are white spaces)

Set Auto Display Page Retain : 0x79

Direction	PC → A202
Command	0x4D 0x79 0xHH 0xLL
Explain	0x4D=Leading Code of PC; 0x79=**Set Auto Display Page Retain** Command; 0xHHLL=Seconds of Auto Display page to be Retained on LCD, from 0000 to 9999 sec. 0xHH=high eight bits, 0xLL=low eight bits.
Example	0x4D 0x79 0x00 0x10 (Set Auto Display Retain 0x0010=16 seconds displayed on LCD);
Response	A202 →PC
Command	0xFA
Explain	Acknowledge OK
Example	0xFA

Get Auto Display Page Retain : 0x7A and **Report Auto Display Page Retain** : 0x7B

Direction	PC → A202
Command	0x4D 0x7A
Explain	0x4D=Leading Code of PC; 0x7A=**Get Auto Display Page Retain** Command;
Example	0x4D 0x7A
Response	A202 →PC
Command	0x53 0x7B 0xHH 0xLL
Explain	0x53=Leading Code of A202; 0x7B=**Report Auto Display Page Retain** Command; 0xHHLL=Seconds of First Display to be Retained on LCD, from 0000 to 9999 sec. 0xHH=high eight bits, 0xLL=low eight bits.
Example	0x53 0x7B 0x00 0x10 (The Auto Display Retain Time is 0x0010=16 seconds)

Set Auto Display Page Globally ON/OFF : 0x7C

Direction	PC → A202
Command	0x4D 0x7C 0x0N
Explain	0x4D=Leading Code of PC; 0x7C=**Set Auto Display Page Globally ON/OFF** Command; 0x0N=Switch of Display Auto Page, 0x01=ON, 0x00=OFF. This Command is the first priority to enable or disable all the Enabled Auto Pages to be displayed. It is necessary when system want to display message but do not like Auto Pages to cover with after, switch OFF(or disable) will prevent this situation
Example	0x4D 0x7C 0x00 (Set Auto Display Globally OFF) 0x4D 0x7C 0x01 (Set Auto Display Globally ON)
Response	A202 →PC
Command	0xFA
Explain	Acknowledge OK
Example	0xFA

Get Auto Display Page Globally ON/OFF status : 0x7D and **Report Auto Display Page Globally ON/OFF status** : 0x7E

Direction	PC → A202
Command	0x4D 0x7D
Explain	0x4D=Leading Code of PC; 0x7D=**Get Auto Display Page Globally ON/OFF status** Command;
Example	0x4D 0x7D
Response	A202 →PC
Command	0x53 0x7E 0x0N
Explain	0x53=Leading Code of A202; 0x7E=**Report Auto Display Page Globally ON/OFF status** Command; 0x0N=Switch of Display Auto Page, 0x01=ON, 0x00=OFF.

Example	0x53 0x7E 0x00 (The Globally Auto Page Display Switch is OFF)

Set Auto Shut Down Timer : 0x7F

Direction	PC → A202
Command	0x4D 0x7F 0xHH 0xMM
Explain	0x4D=Leading Code of PC; 0x7F=**Set Auto Shut Down Timer** Command; 0xHH=The hour to Auto Shut Down the system, from 0 to 23 (24h mode); 0xMM=The minute to Auto Shut Down the system, from 0 to 59; After this command is setup, A202 will to compare the RTC in A202 with 0xHH:0xMM (formed to hh:mm), if RTC is arrive to hh:mm and Auto Shut Down Switch (command 0x82) is Turn ON, then A202 will try to turn off system by switch ON_OFF ATX Power switch one time.
Example	0x4D 0x7F 0x0C 0x0A (Set the Auto Shut Down Timer to 12:10 to shut down system daily)
Response	A202 →PC
Command	0xFA
Explain	Acknowledge OK
Example	0xFA

Get Auto Shut Down Timer Setting Value : 0x80 and **Report Auto Shut Down Timer Setting Value** : 0x81

Direction	PC → A202
Command	0x4D 0x80
Explain	0x4D=Leading Code of PC; 0x80=**Get Auto Shut Down Timer Setting Value** Command;
Example	0x4D 0x80
Response	A202 →PC
Command	0x53 0x81 0xHH 0xMM
Explain	0x53=Leading Code of A202; 0x81=**Report Auto Shut Down Timer Setting Value** Command; 0xHH=The hour to Auto Shut Down the system, from 0 to 23 (24h mode); 0xMM=The minute to Auto Shut Down the system, from 0 to 59;
Example	0x53 0x81 0x0B 0x0A (The Auto Shut Down Timer is set on 12:10)

Set Auto Shut Down ON/OFF : 0x82

Direction	PC → A202
Command	0x4D 0x82 0x0N
Explain	0x4D=Leading Code of PC; 0x82=**Set Auto Shut Down ON/OFF** Command; 0x0N=Switch of Auto Shut Down, 0x01=ON, 0x00=OFF.
Example	0x4D 0x82 0x00 (Set Auto Shut Down OFF) 0x4D 0x82 0x01 (Set Auto Shut Down ON)
Response	A202 →PC
Command	0xFA
Explain	Acknowledge OK
Example	0xFA

Get Auto Shut Down ON/OFF status : 0x83 and **Report Auto Shut Down ON/OFF status** : 0x84

Direction	PC → A202
Command	0x4D 0x83
Explain	0x4D=Leading Code of PC; 0x83=**Get Auto Shut Down ON/OFF status** Command;
Example	0x4D 0x83
Response	A202 →PC
Command	0x53 0x84 0x0N
Explain	0x53=Leading Code of A202; 0x84=**Report Auto Shut Down ON/OFF status** Command; 0x0N=Switch of Auto Shut Down, 0x01=ON, 0x00=OFF.

Example	0x53 0x84 0x00 (The Auto Shut Down Switch is OFF)

Set Auto TurnOn Timer : 0x85

Direction	PC → A202
Command	0x4D 0x85 0xHH 0xMM
Explain	0x4D=Leading Code of PC; 0x85=**Set Auto Shut Down Timer** Command; 0xHH=The hour to Auto Turn On the system, from 0 to 23 (24h mode); 0xMM=The minute to Auto Turn On the system, from 0 to 59; After this command is setup, A202 will to compare the RTC in A202 with 0xHH:0xMM (formed to hh:mm), if RTC is arrive to hh:mm and Auto Turn On Switch (command 0x88) is Turn ON, then A202 will try to turn on system by switch ON_OFF ATX Power switch one time.
Example	0x4D 0x85 0x07 0x1E (Set the Auto Turn On Timer to 07:30 to turn on system daily)
Response	A202 →PC
Command	0xFA
Explain	Acknowledge OK
Example	0xFA

Get Auto Turn On Timer Setting Value : 0x86 and **Report Auto Turn On Timer Setting Value** : 0x87

Direction	PC → A202
Command	0x4D 0x86
Explain	0x4D=Leading Code of PC; 0x86=**Get Auto Turn On Timer Setting Value** Command;
Example	0x4D 0x86
Response	A202 →PC
Command	0x53 0x87 0xHH 0xMM
Explain	0x53=Leading Code of A202; 0x87=**Report Auto Turn On Timer Setting Value** Command; 0xHH=The hour to Auto Turn On the system, from 0 to 23 (24h mode); 0xMM=The minute to Auto Turn On the system, from 0 to 59;
Example	0x53 0x87 0x07 0x1E (The Auto Turn On Timer is set on 07:30)

Set Auto Turn On ON/OFF : 0x88

Direction	PC → A202
Command	0x4D 0x88 0x0N
Explain	0x4D=Leading Code of PC; 0x88=**Set Auto Turn On ON/OFF** Command; 0x0N=Switch of Auto Turn On, 0x01=ON, 0x00=OFF.
Example	0x4D 0x88 0x00 (Set Auto Turn On OFF) 0x4D 0x88 0x01 (Set Auto Turn On ON)
Response	A202 →PC
Command	0xFA
Explain	Acknowledge OK
Example	0xFA

Get Auto Turn On ON/OFF status : 0x89 and **Report Auto Turn On ON/OFF status** : 0x8A

Direction	PC → A202
Command	0x4D 0x89
Explain	0x4D=Leading Code of PC; 0x89=**Get Auto Turn On ON/OFF status** Command;
Example	0x4D 0x89
Response	A202 →PC
Command	0x53 0x8A 0x0N
Explain	0x53=Leading Code of A202; 0x8A=**Report Auto Turn On ON/OFF status** Command; 0x0N=Switch of Auto Turn On, 0x01=ON, 0x00=OFF.
Example	0x53 0x8A 0x00 (The Auto Turn On Switch is OFF)

Set Watch Dog Timer : 0x8B

Direction	PC → A202
Command	0x4D 0x8B 0xHH 0xLL
Explain	0x4D=Leading Code of PC; 0x8B=**Set Watch Dog Timer** Command; 0xHHLL=Seconds of Watch Dog Timer to start count to, from 0000 to 9999 sec. 0xHH=high eight bits, 0xLL=low eight bits. After this command is setup and if the Watch Dog Switch (command **0x8E**) is turn ON, A202 will start to count up this timer, during this period, if there is no Clear Watch Dog Command (command **0x91**) come in, then A202 will start to Reset system by Turn ON_OFF the Reset Button of the system one time, and then disable Watch Dog Timer by turn off the Watch Dog Switch Command (command **0x8E**);
Example	0x4D 0x8B 0x02 0x58 (Set the Watch Dog Timer to 0x0258=600 seconds)
Response	A202 →PC
Command	0xFA
Explain	Acknowledge OK
Example	0xFA

Get Watch Dog Timer Setting Value : 0x8C and **Report Watch Dog Timer Setting Value** : 0x8D

Direction	PC → A202
Command	0x4D 0x8C
Explain	0x4D=Leading Code of PC; 0x8C=**Get Watch Dog Timer Setting Value** Command;
Example	0x4D 0x8C
Response	A202 →PC
Command	0x53 0x8D 0xHH 0xLL
Explain	0x53=Leading Code of A202; 0x8D=**Report Watch Dog Timer Setting Value** Command; 0xHHLL=Seconds of Watch Dog Timer to start count to, from 0000 to 9999 sec. 0xHH=high eight bits, 0xLL=low eight bits.
Example	0x53 0x8D 0x02 0x58 (The Watch Dog Timer is set on 0x0258=600 seconds)

Set Watch Dog ON/OFF : 0x8E

Direction	PC → A202
Command	0x4D 0x8E 0x0N
Explain	0x4D=Leading Code of PC; 0x8E=**Set Watch Dog ON/OFF** Command; 0x0N=Switch of Watch Dog, 0x01=ON, 0x00=OFF.
Example	0x4D 0x8E 0x00 (Set Watch Dog OFF) 0x4D 0x8E 0x01 (Set Watch Dog ON)
Response	A202 →PC
Command	0xFA
Explain	Acknowledge OK
Example	0xFA

Get Watch Dog ON/OFF status : 0x8F and **Report Watch Dog ON/OFF status** : 0x90

Direction	PC → A202
Command	0x4D 0x8F
Explain	0x4D=Leading Code of PC; 0x8F=**Get Watch Dog ON/OFF status** Command;
Example	0x4D 0x8F
Response	A202 →PC
Command	0x53 0x90 0x0N
Explain	0x53=Leading Code of A202; 0x90=**Report Watch Dog ON/OFF status** Command; 0x0N=Switch of Watch Dog, 0x01=ON, 0x00=OFF.
Example	0x53 0x90 0x00 (The Watch Dog Switch is OFF)

Clear Watch Dog : 0x91

Direction	PC → A202

Command	0x4D 0x91
Explain	0x4D=Leading Code of PC; 0x91=**Clear Watch Dog** Command; **Note:** This Command will clear Watch Dog to zero, which will prevent Watch Dog to count to over Watch Dog Timer and reset the system. System must period to send this command to A202 in time when the Watch Dog is enabled.
Example	0x4D 0x91
Response	A202 →PC
Command	0xFA
Explain	Acknowledge OK
Example	0xFA

Write Data to LCD Data Register : 0x92

Direction	PC → A202
Command	0x4D 0x92 0xNN
Explain	0x4D=Leading Code of PC; 0x92= **Write Data to LCD Data Register** Command; 0xNN, the data will be write to the Data Register of LCD Module. **Note:** This Command will write the 0xNN to the Data Register of LCD Module Controller, which will directly to control the behaviors of LCD Module, Detail please reference Hitachi LCD Module Controller Spec.
Example	0x4D 0x92 0x49 (Write 0x49 to LCD Module Data Register, which will cause LCD to display **I** (0x49) character on its current position)
Response	A202 →PC
Command	0xFA
Explain	Acknowledge OK
Example	0xFA

Write Control Data to LCD Instruction Register : 0x93

Direction	PC → A202
Command	0x4D 0x93 0xNN
Explain	0x4D=Leading Code of PC; 0x93= **Write Control Data to LCD Instruction Register** Command; 0xNN, the control data will be written to the Instruction Register of LCD Module. **Note:** This Command will write the 0xNN to the Instruction Register of LCD Module Controller, which will directly to control the behaviors of LCD Module, Detail please reference Hitachi LCD Module Controller Spec.
Example	0x4D 0x93 0x01 (Write 0x01 to LCD Module Instruction Register, which will cause LCD to Clear Display)
Response	A202 →PC
Command	0xFA
Explain	Acknowledge OK
Example	0xFA

Read Data from LCD Data Register : 0x94 and **Report Data from LCD Data Register** : 0x95

Direction	PC → A202
Command	0x4D 0x94
Explain	0x4D=Leading Code of PC; 0x93=**Read Data from LCD Instruction Register** Command; **Note:** This Command will Read from the Data Register of LCD Module Controller, which will directly to control the behaviors of LCD Module, Detail please reference Hitachi LCD Module Controller Spec.
Example	0x4D 0x94
Response	A202 →PC
Command	0x53 0x95 0xNN
Explain	0x53=Leading Code of A202; 0x95= **Report Data from LCD Data Register**

	Command; 0xNN=The data in Data Register of LCD Module;
Example	0x53 0x95 0x49 (Character **I** (0x49) now is on current display position now)

Set GPIO : 0x96

Direction	PC → A202
Command	0x4D 0x96 0x0P
Explain	0x4D=Leading Code of PC; 0x96=**Set GPIO** Command; 0x0P, the GPIO Data, which will be latch to GPIO, 1=High, 0=Low, bit0=GPIO0(JP9, pin1), bit1=GPIO1(JP9, pin2), bit2=GPIO2(JP9, pin3), bit3=GPIO3(JP9, pin4) **Note:** The 4 GPIO provided by A202 on JP9 are belong to weak pull high, open drain, bi-direction CMOS I/O pin, detail description please reference to Winbond W78E54B Controller Spec. IO Port 4.
Example	0x4D 0x96 0x01 (Turn On GPIO0 and Turn OFF GPIO1, 2, 3 at the same time)
Response	A202 →PC
Command	0xFA
Explain	Acknowledge OK
Example	0xFA

Read GPIO status : 0x97 and **Report GPIO status** : 0x98

Direction	PC → A202
Command	0x4D 0x97
Explain	0x4D=Leading Code of PC; 0x97=**Read GPIO status** Command;
Example	0x4D 0x97
Response	A202 →PC
Command	0x53 0x98 0x0P
Explain	0x53=Leading Code of A202; 0x98= **Report GPIO status** Command; 0x0P, the GPIO Status Data, which reflect the real status of GPIO outside now, 1=High, 0=Low, bit0=GPIO0(JP9, pin1), bit1=GPIO1(JP9, pin2), bit2=GPIO2(JP9, pin3), bit3=GPIO3(JP9, pin4)
Example	0x53 0x98 0x03 (GPIO0, 1 is high, GPIO2, 3 is low)

Shut Down System now : 0x99

Direction	PC → A202
Command	0x4D 0x99
Explain	0x4D=Leading Code of PC; 0x99=**Shut Down System now** Command; **Note :** After receipt this command, A202 will try to short ATX Power Switch once to cause system shut down.
Example	0x4D 0x99
Response	A202 →PC
Command	0xFA
Explain	Acknowledge OK, but, because system is shut down now, so system should not receive this Ack, except that system still alive.
Example	0xFA

Reset System now : 0x9A

Direction	PC → A202
Command	0x4D 0x9A
Explain	0x4D=Leading Code of PC; 0x9A=**Reset System now** Command; **Note :** After receipt this command, A202 will try to short Reset Switch once to cause system to enter reset.
Example	0x4D 0x9A
Response	A202 →PC
Command	0xFA
Explain	Acknowledge OK, but, because system is been reset now, so system should not receive

	this Ack, except that system still not been reset successfully.
Example	0xFA

Cursor ON/OFF : 0x9B

Direction	PC → A202
Command	0x4D 0x9B 0x0S
Explain	0x4D=Leading Code of PC; 0x9B=**Cursor ON/OFF** Command; 0x0S=ON/OFF Switch, 0x00=OFF, 0x01=ON;
Example	0x4D 0x9B 0x01 (Cursor On) 0x4D 0x9B 0x00 (Cursor Off)
Response	A202 →PC
Command	0xFA
Explain	Acknowledge OK
Example	0xFA

Cursor Blinking ON/OFF : 0x9C

Direction	PC → A202
Command	0x4D 0x9C 0x0S
Explain	0x4D=Leading Code of PC; 0x9C=**Cursor Blinking ON/OFF** Command; 0x0S=ON/OFF Switch, 0x00=OFF, 0x01=ON;
Example	0x4D 0x9C 0x01 (Cursor Blinking On) 0x4D 0x9C 0x00 (Cursor Blinking Off)
Response	A202 →PC
Command	0xFA
Explain	Acknowledge OK
Example	0xFA

Print String : 0x9D

Direction	PC → A202
Command	0x4D 0x9D 0xCC_1 0xCC_2 … 0xCC_n 0x0X
Explain	0x4D=Leading Code of PC; 0x9D=**Print String** Command; 0xCC_n=ASCII Code of Character for Display; 0x0X=Print Control Character, 0x00=Terminate, 0x0A=Terminate and Feed a New Line. **Note:** This command specially useful for print stream text to LCD, the start position depend on last print over, user could use **Clear LCD** (0x0D) first to clear screen and move cursor to home position, or use **Cursor Go to** (0x54) move cursor to wanted position then start print text. Meanwhile if there are over 16 characters displayed on the same line, the left character will be automatically swap to the next line.
Example	0x4D 0x9D 0x41 0x42 0x43 0x00 (print **ABC** to LCD) 0x4D 0x54 0x03 0x01 (Move Cursor to Line 1, column 3) 0x4D 0x9D 0x41 0x42 0x43 0x0A (print **ABC** and feed a new line)
Response	A202 →PC
Command	0xFA
Explain	Acknowledge OK
Example	0xFA

Negative Ack the Command not Support : 0xFB

Direction	A202 → PC
Command	0x53 0xFB 0xXX
Emphasis	0x53=Leading Code of A202; 0xFB=Negative Ack; 0xXX Command;
Example	0x53 0xFB 0xF0 (NAK 0xF0 not Support)

Appendix B

A. Connect A202 to RS232 (±12V Signal Level)

JS1	1	NC		Float
	2	Tx	Out	A202 Output to PC
	3	Rx	In	A202 Input from PC
	4	NC		Inner Connect to Pin 6
	5	Gnd		Connect to Ground
	6	NC		Inner Connect to Pin 4
	7	NC		Inner Connect to Pin 8
	8	NC		Inner Connect to Pin 7
	9	NC		Float
	10	NC		Float

Note: JS1 uses fixed 1200 Baud Rate, 8 bit, 1 stop bit, no parity check,±12V Signal.

B. Connect A202 to UART (+5V Signal Level)

JP5	1	Power		+5VDC out
	2	Rx	In	A202 Input from PC
	3	Tx	Out	A202 Output to PC
	4	Power		Ground

Note: JJP5 uses fixed 1200 Baud Rate, 8 bit, 1 stop bit, no parity check, +5V TTL Signal.

Appendix C

LCD-Module-supported ASCII codes

	!	“	#	$	%	&	‘	(	)	*	+	,	-	.	/
0x20	0x21	0x22	0x23	0x24	0x25	0x26	0x27	0x28	0x29	0x2A	0x2B	0x2C	0x2D	0x2E	0x2F

0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
0x30	0x31	0x32	0x33	0x34	0x35	0x36	0x37	0x38	0x39	0x3A	0x3B	0x3C	0x3D	0x3E	0x3F

@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
0x40	0x41	0x42	0x43	0x44	0x45	0x46	0x47	0x48	0x49	0x4A	0x4B	0x4C	0x4D	0x4E	0x4F

P	Q	R	S	T	U	V	W	X	Y	Z	[	¥	]	^	_
0x50	0x51	0x52	0x53	0x54	0x55	0x56	0x57	0x58	0x59	0x5A	0x5B	0x5C	0x5D	0x5E	0x5F

`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
0x60	0x61	0x62	0x63	0x64	0x65	0x66	0x67	0x68	0x69	0x6A	0x6B	0x6C	0x6D	0x6E	0x6F

p	q	r	s	t	u	v	w	x	y	z	{	|	}	→	←
0x70	0x71	0x72	0x73	0x74	0x75	0x76	0x77	0x78	0x79	0x7A	0x7B	0x7C	0x7D	0x7E	0x7F

**ASCII codes over the 0x80 are reserved for special symbols, please contact your sales representatives for details.

Appendix D

```
/*
 *
 *    Title              : A202.c --- A202 Demo program
 *    Editor             : Davis Wang in ICP Electronic
 *    Compilier          : TCC Ver2.01
 *                         Use "TCC A202.c" to Compile A202.c
 *    OS                 : DOS 6.22 or Above
 *    Execute            : Use "C:\A202 String0 String1"
 *                         where String0 will display on LCD line 0
 *                               String1 will display on LCD line 1
 *                         e.g. C:\A202 ICP Electronic
 *
 */

#include <dos.h>
#include <stdio.h>
#include <conio.h>
#define COM1   0x3f8
#define COM2   0x2f8
#define IOBASE COM1



void InitUART(void){

     outport(IOBASE+3, 0x80);    /* Line Control Register */
     outport(IOBASE+0, 0x60);    /* Divisor Latch Low     */
     outport(IOBASE+1, 0x00);    /* Divisor Latch High    */
     outport(IOBASE+3, 0x03);
}


void SendByte(char ch){

     while(!(inport(IOBASE+5) & 0x20));
     outport(IOBASE, ch);
}

char GetByte(void){

     while(!(inport(IOBASE+5) & 0x01));
     return inport(IOBASE);
}


void Clear_LCD(void){

     SendByte(0x4D);
     SendByte(0x0D);
```

```
}

void Stop_Auto_Display(void){

    SendByte(0x4D);
    SendByte(0x7C);
    SendByte(0x00);
}


void SendString(int line, char *s){
int i,j;

     i=strlen(s);
     SendByte(0x4D);
     SendByte(0x0C);
     SendByte(line);
     SendByte(i);
     for(j=0; j<i; j++)SendByte(*(s+j));
}

void main(int argc, char *argv[]){


     InitUART();
     Clear_LCD();
     Stop_Auto_Display();
     switch(argc){
       case 2:
              SendString(0, argv[1]);
              break;
       case 3:
              SendString(0, argv[1]);
              SendString(1, argv[2]);
              break;
     }
}
```

```
/*
 *
 *    Title     : A202.c Demo program
 *    Editor    : Davis Wang in ICP Electronic
 *    Compilier : TCC Ver2.01
 *                Use "TCC A202.C" to Compile A202.C
 *    OS        : DOS 6.22 or Above
 *    Execute   : USE "C:\A202"
 *                e.g. C:\A202
 *    Result    : press any key on A202, and will see key status reflect on
 *                PC monitor
 *
 */

#include <dos.h>
#include <stdio.h>
#include <conio.h>
#define COM1   0x3f8
#define COM2   0x2f8
#define IOBASE COM1


void InitUART(void){

     outport(IOBASE+3, 0x80);    /* Line Control Register */
     outport(IOBASE+0, 0x60);    /* Divisor Latch Low     */
     outport(IOBASE+1, 0x00);    /* Divisor Latch High    */
     outport(IOBASE+3, 0x03);
}


void SendByte(char ch){

     while(!(inport(IOBASE+5) & 0x20));
     outport(IOBASE, ch);
}


unsigned char Rs232Available(void){

     return inport(IOBASE+5)&0x01;
}


char GetByte(void){

     while(!(inport(IOBASE+5) & 0x01));
     return inport(IOBASE);
}
```

```
void SendString(int line, char *s){
int i,j;

     i=strlen(s);
     SendByte(0x4D);
     SendByte(0x0C);
     SendByte(line);
     SendByte(i);
     for(j=0; j<i; j++)SendByte(*(s+j));
}

void Read_A202(void){
unsigned char Data1;
unsigned char Data2;

     if(GetByte()!=0x53)return;  /* A202 Leading Byte */
     switch(GetByte()){
      case 0x01: /* Report ID */
             Data1=GetByte();
             Data2=GetByte();
             printf("Board ID is 0x%04X\n", (Data1<<8)|Data2);
             break;
      case 0x05: /* Report Key Status */
             Data1=GetByte();   /* Data Byte 1 */
             Data2=GetByte();   /* Data Byte 2 */
             switch(Data2&0x1F){
                 case 0x00:printf("Key   Released\n"); break;
                 case 0x01:printf("ESC   Pressed\n"); break;
                 case 0x02:printf("UP    Pressed\n"); break;
                 case 0x04:printf("Enter Pressed\n"); break;
                 case 0x08:printf("Down  Pressed\n"); break;
                 case 0x10:printf("Fn    Pressed\n"); break;
             }
             break;
     }
}

void GetID(void){

     SendByte(0x4D);
     SendByte(0x00);
}

void main(void){

     InitUART();
     GetID();
     while(!kbhit()){
       if(Rs232Available())Read_A202();
     }
}
```

```
/*
 *
 *    Title     : MYIP.C Demo program
 *    Editor    : Davis Wang in ICP Electronic
 *    Compilier : TCC Ver2.01
 *                Use "TCC MYIP.C" to Compile MYIP.C
 *    OS        : DOS 6.22 or Above
 *
 */

#include <dos.h>
#include <stdio.h>
#include <conio.h>
#define COM1 0x3f8
#define COM2 0x2f8
#define IOBASE COM1


char Quit=0;
char data;
char pos=0;
char A[]={0, 1, 2, 4, 5, 6, 8, 9, 10, 12, 13, 14};
char I[]={'1', '2', '7', '0', '0', '0', '0', '0', '0', '0', '0', '1'};
char i, j;


void InitUART(void){

     outport(IOBASE+3, 0x80);    /* Line Control Register */
     outport(IOBASE+0, 0x60);    /* Divisor Latch Low     */
     outport(IOBASE+1, 0x00);    /* Divisor Latch High    */
     outport(IOBASE+3, 0x03);
}


void SendByte(char ch){

     while(!(inport(IOBASE+5) & 0x20));
     outport(IOBASE, ch);
}



char GetByte(void){

     while(!(inport(IOBASE+5) & 0x01));
     return inport(IOBASE);
}
```

```
unsigned char Rs232Avail(void){

     return inport(IOBASE+5)&0x01;
}

void Clear_LCD(void){

     SendByte(0x4D);
     SendByte(0x0D);
}

void Stop_Auto_Display(void){

     SendByte(0x4D);
     SendByte(0x7C);
     SendByte(0x00);
}

void SendString(int line, char *s){
int i,j;

     i=strlen(s);
     SendByte(0x4D);
     SendByte(0x0C);
     SendByte(line);
     SendByte(i);
     for(j=0; j<i; j++)SendByte(*(s+j));
}

void cursor_goto(unsigned char x, unsigned char y){

     SendByte(0x4D);
     SendByte(0x54);
     SendByte(x);
     SendByte(y);
}

void cursor_on(void){

     SendByte(0x4D);
     SendByte(0x9B);
     SendByte(0x01);
}

void cursor_off(void){

     SendByte(0x4D);
     SendByte(0x9B);
     SendByte(0x00);
}


void blink_on(void){
```

```
    SendByte(0x4D);
    SendByte(0x9C);
    SendByte(0x01);
}

void blink_off(void){

    SendByte(0x4D);
    SendByte(0x9C);
    SendByte(0x00);
}


void print_string(char *s){
int i, count;

    count=strlen(s);
    SendByte(0x4D);
    SendByte(0x9D);
    for(i=0; i<count; i++)SendByte(*(s+i));
    SendByte(0x00);
}

void print_char(char ch){

    SendByte(0x4D);
    SendByte(0x9D);
    SendByte(ch);
    SendByte(0x00);
}


void print_myip_template(void){

    print_string("MY IP ADDRESS :\n");
    for(j=0; j<3; j++){
     for(i=j*3; i<(j*3+3); i++)print_char(I[i]); print_char(':');
    }
    for(i=9; i<12; i++)print_char(I[i]);
}

void main(void){

    InitUART();
    Clear_LCD();
    Stop_Auto_Display();
    print_myip_template();
    cursor_goto(0, 1);
    cursor_on();
    blink_on();
    while(!kbhit()&&!Quit){
    if(Rs232Avail()){
```

```
        if(GetByte()==0x53){
           switch(GetByte()){
           case 0x05:  /* Report Button Status */
                   data=GetByte();  /* skip data byte 0 */
                   data=GetByte();  /*      data byte 1 */
                   switch(data){
                   case 0x00:    /* Key_Released */
                           break;
                   case 0x01:    /* ESC_Key */
                           Clear_LCD();
                           print_string(" Good BYE !!");
                           cursor_off();
                           blink_off();
                           Quit=1;
                           break;
                   case 0x02:    /* Up_Key */
                           I[pos]=I[pos]+1;
                           if(I[pos]>'9')I[pos]='0';
                           print_char(I[pos]);
                           cursor_goto(A[pos], 1);
                           break;
                   case 0x04:    /* Enter_Key */
                           pos=pos+1;
                           if(pos>=12)pos=0;
                           cursor_goto(A[pos], 1);
                           break;
                   case 0x08:    /* Down_Key */
                           I[pos]=I[pos]-1;
                           if(I[pos]<'0')I[pos]='9';
                           print_char(I[pos]);
                           cursor_goto(A[pos], 1);
                           break;
                   case 0x10:    /* Fn_Key */
                           break;
                   }
                   break;
           }
        }
     }
     }
     printf("My IP Address is  %3d:%3d:%3d:%3d\n",
         (I[0]-'0')*100+(I[1]-'0')*10+(I[2]-'0'),
         (I[3]-'0')*100+(I[4]-'0')*10+(I[5]-'0'),
         (I[6]-'0')*100+(I[7]-'0')*10+(I[8]-'0'),
         (I[9]-'0')*100+(I[10]-'0')*10+(I[11]-'0'));
}
```

```
/*
 *
 *   Title     : A202.C Demo Program
 *   Editor    : Davis Wang in ICP Electronic
 *   Compilier : gcc
 *               use "gcc -o A202 A202.c" to compile A202.C
 *   OS        : Linux
 *   Execute   : USE "[..]$A202 String0 String1" as root
 *               Where String0 will display on LCD line0
 *                     String1 will display on LCD line1
 *               e.g. [root@localhost davis]$ ./A202 ICP Electronic
 *
 */

#include <stdio.h>
#include <sys/ioctl.h>
#include <fcntl.h>
#include <termios.h>
#include <stdlib.h>


struct termios tio;
int fd;

void InitUART(void){

    if((fd=open("/dev/ttyS0", O_RDWR|O_NDELAY|O_NOCTTY))<0){
       printf("Could not open Serial Port\n");
       exit(1);
    }
    tio.c_cflag       =B1200|CS8|CREAD|CLOCAL;
    tio.c_cc[VTIME]   =0;
    tio.c_cc[VMIN]    =0;
    tcflush(fd, TCIFLUSH);
    tcsetattr(fd, TCSANOW, &tio);
    fcntl(fd, F_SETFL, FNDELAY);
}

void Clear_LCD(void){
char s[]={0x4D, 0x0D};

    write(fd, s, 2);
}


void Stop_Auto_Display(void){
char s[]={0x4D, 0x7C, 0x00};

    write(fd, s, 3);
}
```

```
void SendString(int line, char *s){
unsigned char c[]={0x4D, 0x0C, 0x00, 0x00};

     c[2]=line;
     c[3]=strlen(s);
     write(fd, c, 4);
     write(fd, s, strlen(s));
}



int main(int argc, char *argv[]){

    InitUART();
    Clear_LCD();
    Stop_Auto_Display();
    switch(argc){
      case 2:
              SendString(0, argv[1]);
              break;
      case 3:
              SendString(0, argv[1]);
              SendString(1, argv[2]);
              break;
    }
    close(fd);
}
```

```
/*
 *
 *    Title     : WDT.c Demo program
 *    Editor    : Davis Wang in ICP Electronic
 *    Compilier : TCC Ver2.01
 *                Use "TCC WDT.C" to Compile WDT.C
 *    OS        : DOS 6.22 or Above
 *    Execute   : USE "C:\WDT <time>"
 *              where <time> is the time that WDT will start to count down
 *                 e.g. C:\wdt 10  --> Setup WDT Timer=10sec and start
 *
 */



#include <dos.h>
#include <stdio.h>
#include <conio.h>
#define COM1   0x3f8
#define COM2   0x2f8
#define IOBASE COM1



void InitUART(void){

     outport(IOBASE+3, 0x80);    /* Line Control Register */
     outport(IOBASE+0, 0x60);    /* Divisor Latch Low     */
     outport(IOBASE+1, 0x00);    /* Divisor Latch High    */
     outport(IOBASE+3, 0x03);
}


void SendByte(char ch){

     while(!(inport(IOBASE+5) & 0x20));
     outport(IOBASE, ch);
}


unsigned char GetByte(void){

     while(!(inport(IOBASE+5) & 0x01));
     return inport(IOBASE);
}
```

```
void Turn_On_WDT(void){


      SendByte(0x4D);
      SendByte(0x8E);
      SendByte(0x01);
}


void Turn_Off_WDT(void){


      SendByte(0x4D);
      SendByte(0x8E);
      SendByte(0x00);
}



void Clear_WDT(void){


      SendByte(0x4D);
      SendByte(0x91);
}



unsigned int Get_WDT_Timer(void){
unsigned char HiByte, LoByte;

      SendByte(0x4D);
      SendByte(0x8C);
      if(GetByte()!=0x53)return 0xFFFF;
      if(GetByte()!=0x8D)return 0xFFFF;
      HiByte=GetByte();
      LoByte=GetByte();
      return (HiByte<<8)|LoByte;
}


void Set_WDT_Timer(unsigned int time){
unsigned char HiByte, LoByte;

      HiByte=(time&0xFF00)>>8;
      LoByte=time&0x00FF;
      SendByte(0x4D);
      SendByte(0x8B);
      SendByte(HiByte);
      SendByte(LoByte);
}
```

```
void Do_My_Work(void){
unsigned int i=1000;

     while(i--);
}


void main(int argc, char *argv[]){
unsigned int time;

     InitUART();
     switch(argc){
       case 1:
            printf("Use 'C:\WDT <time>' to setup WDT\n");
            exit(1);
            break;
       case 2:
            time=atoi(argv[1]);
            if(Get_WDT_Timer()!=time)Set_WDT_Timer(time);
            Turn_On_WDT();
            break;

     }

     while(!kbhit()){
     Do_My_Work();
     Clear_WDT();
     }
     Turn_Off_WDT();
}
```